

**CUTTING FAT OR REMOVING THE
BRAIN: IS THE DIVISIONAL ADA
BATTALION HEADQUARTERS
NECESSARY?**

**A MONOGRAPH
BY
Major Daniel P. Sauter III
Air Defense**

**School of Advanced Military Studies
United States Army Command and General Staff
College
Fort Leavenworth, Kansas**

First Term AY 98-99

Approved for Public Release Distribution is Unlimited

DTIC QUALITY INSPECTED 2

19990804 086

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 17 December 1998	3. REPORT TYPE AND DATES COVERED Monograph	
4. TITLE AND SUBTITLE CUTTING FAT OR REMOVING THE BRAIN? IS THE DIVISIONAL ADA BATTALION HEADQUARTERS NECESSARY?			5. FUNDING NUMBERS	
6. AUTHOR(S) MAYOR DANIEL P. SANTER III				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) School of Advanced Military Studies Command and General Staff College Fort Leavenworth, Kansas 66027			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Command and General Staff College Fort Leavenworth, Kansas 66027			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION / AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE DISTRIBUTION UNLIMITED.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) SEE ATTACHED				
14. SUBJECT TERMS AIR DEFENSE ARTILLERY, ADA, FORCE XXI, COMMAND AND CONTROL, HEADQUARTERS ORGANIZATIONAL STRUCTURE			15. NUMBER OF PAGES 60	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UNLIMITED	

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

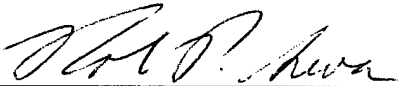
Major Daniel P. Sauter III

Title of Monograph: *Cutting Fat or Removing the Brain: Is the Divisional ADA
Battalion Headquarters Necessary?*

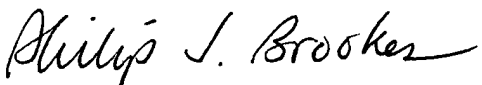
Approved by:



LTC Dale C. Eikmeier, MA Monograph Director



LTC Robin P. Swan, MMAS Director, School of Advanced
Military Studies



Philip J. Brookes, Ph.D. Director, Graduate Degree
Program

Accepted this 16th Day of December 1998

ABSTRACT

CUTTING FAT OR REMOVING THE BRAIN: IS THE DIVISIONAL ADA BATTALION HEADQUARTERS NECESSARY? by MAJ Daniel P. Sauter III, USA, 60 pages.

As the United States attempts to adapt to the meet the changing conditions of the twenty-first century, organizational structure is an issue of heated debate. The central issue of the debate is whether or not the Army's current hierarchical structure will be effective in a twenty-first century environment. Many argue that efficiencies through technological improvement have eliminated the need for intermediate headquarters. "Streamlining" or "flattening" organizations has been a recent trend in and outside of the military. This monograph examines whether the divisional ADA battalion headquarters, an intermediate headquarters, is necessary to command and control divisional air defense operations in a Force XXI environment.

Although the scope of this work is limited to the command and control function of the ADA battalion headquarters, it provides a framework for the evaluation of additional functions of intermediate headquarters. The monograph begins by examining the future environment in which air defense operations will occur. The Army's Force XXI operational concepts establish the foundation for future air defense operations.

Alternative organizations are then explained. Alternatives include: the current organization, replacing the headquarters with an existing headquarters within the division, and eliminating the headquarters. Next, evaluation criteria which are measures of effective command and control are established. Evaluation of the alternatives is the preponderance of the work. Finally, the monograph concludes that the ADA battalion headquarters is still necessary to command and control divisional air defense operations.

TABLE OF CONTENTS

Introduction.....	2
Chapter 1 Environment.....	4
Chapter 2 Organization.....	8
Chapter 3 Criteria.....	18
Chapter 4 Analysis.....	24
Chapter 5 Conclusion.....	42
Appendix	
A. ADA Organizations.....	45
B. Air Defense Command and Control Functions.....	47
Endnotes 	52
Bibliography 	56

INTRODUCTION

The United States Army must be continually ready to enforce national policy, as well as defend the nation. The stakes in these tasks are so high that the United States Army cannot afford to be unprepared for tomorrow's call. The Army must constantly assess how it currently operates and whether change is necessary to meet the conditions of tomorrow. Significant strategic and technological developments have altered the world environment as the United States Army enters the twenty-first century.

The United States Army is carefully assessing doctrine, organizations, training, leadership, and materiel to ensure the Army can meet the demands of a changing world environment. Organizational structure is an area which is receiving considerable attention. The Army is examining whether its traditional hierarchical organizational structures are compatible with exponential advances in information technology. Many argue that efficiencies through technology have eliminated the need for intermediate echelons of command.

"Streamlining" or "flattening" organizations has been a recent trend in both military and corporate circles. Breaking the Phalanx, a book which has stimulated much discussion within the military, argues that the Army's hierarchical command and control structure is incompatible with future warfare.¹ The Army's recent elimination of the engineer brigade headquarters in the Force XXI Heavy Division indicates the Army is following the "streamlining" trend.

Eliminating intermediate headquarters should not be accepted as the blueprint for twenty-first century military organizational structure. Instead, organizational redesign must be based on thorough, case by case, analysis. The Army must be sure that it is cutting fat and not the brains of an organization when eliminating intermediate headquarters.

This monograph provides an analytical framework for evaluating the need for intermediate tactical command and control headquarters. The Air Defense Artillery (ADA) battalion headquarters in the heavy division serves as the subject of analysis. The underlying question in this study is whether the ADA battalion headquarters is necessary to command and control divisional air defense operations in a Force XXI environment. Command and control is only one responsibility of the ADA battalion headquarters. Training, administrative, logistical functions must also be analyzed before deciding to eliminate the headquarters. However, they exceed the scope of this study.

This study uses five steps to determine whether the ADA battalion headquarters is necessary. The first step is examination of the Force XXI environment. Force XXI operational concepts are translated into the future environment for divisional air defense operations. Second, alternative divisional air defense command and control organizations are identified. The current ADA battalion organizational structure and command and control functions are presented as a baseline for the evaluation. Alternative organizations are also identified. Third, evaluation criteria are established. The evaluation criteria are measures of effective command and control; unity of command, unity of effort, synchronization, agility, and versatility. The next step is the most crucial, analysis of the

alternatives. Finally, this monograph concludes that the ADA battalion headquarters is still necessary to command and control divisional air defense operations in a Force XXI environment.

ENVIRONMENT

As the United States Army enters the twenty-first century, the strategic environment is changing. The end of the Cold War has brought about an environment which is "dynamic and uncertain, replete with a host of threats and challenges that have the potential to grow more deadly."² The National Security Strategy "envision[s] strategic actions for supporting democratic growth, human rights, independent judiciary, economic cooperation and available markets, and unrestricted trade."³ This creates a complex and diverse set of potential missions for the U.S. Army. Recent military interventions in Southwest Asia, Somalia, Haiti, and Bosnia illustrate the emerging spectrum of twenty-first century military operations.

An on-going revolution in informational technology is also altering the environment in which the future Army must operate. The availability of information and the speed at which it travels are making many twentieth century organizations and processes ineffective. As "information technology is expected to make a thousandfold advance over the next 20 years," twenty-first century organizations and processes must be capable of leveraging the potential of the emerging informational technology.⁴

The U.S. Army recognizes the need to adapt to the changing strategic and technological environment. Force XXI is the Army's vehicle for change. United States

Army Training and Doctrine Command (TRADOC) Pamphlet 525-5, Force XXI

Operations, is the Army's vision of future military operations. It articulates the Army's "conceptual foundations for War and Operations Other Than War in the early decades of the twenty-first century."⁵ The pamphlet provides a unifying vision for the development of future doctrine, organizations, leadership, training, and materiel. What is Force XXI?

Force XXI is a flexible force. The National Security Strategy demands a force which is capable of performing a diverse range of military operations. Domestic resource constraints do not permit an "Army of Armies" each specialized for a different mission across the spectrum of potential operations. Force XXI must be capable of conducting both conventional war and operations other than war. Although Force XXI must be capable of performing a wide a variety of missions, it must be capable of fighting and winning on the twenty-first century battlefield.

The Force XXI battlefield is characterized by expanded battlespace and increased dispersion and tempo. Battlespace is the "conceptual physical volume in which the commander seeks to dominate the enemy."⁶ It increases with the commander's ability to locate and engage the enemy. Improved sensors increase the width, depth, and height at which the enemy can be acquired. Improved information systems allow this information to be shared, almost instantaneously, at all levels of command. Precision weapons enable commander's to engage the enemy at greater ranges. These technologies increase the Force XXI battlespace.

Advances in technology allow Force XXI forces to disperse on the battlefield.

"Superior timing and speed, controlled by shared information, will allow commanders to

physically mass forces only when necessary.”⁷ While the size of the Force XXI division is smaller than the Army of Excellence Division, its area of operations is increased by almost two and a half times.⁸ Shared knowledge also increases the speed of Force XXI operations.

Tempo is the rate of military action.⁹ Tempo is accelerated by technological improvements in Force XXI. The abundance of near real-time information, on both enemy and friendly forces, speeds the commander’s decision cycle. Force XXI forces can thus act faster than the enemy. Force XXI commander retain the ability to speed or slow tempo in order to maintain the initiative.

Force XXI operational concepts of flexibility, battlespace, dispersion, and agility shape the environment for the study of future divisional air defense operations. For this study it is essential to understand the implication of these concepts on the air threat and air defense command and control.

Air Threat

TRADOC Pamphlet 525-5 states “the most serious challenge to U.S. military superiority will not come from any one state or group but from a process- the proliferation of weapons and technology.”¹⁰ In the early twenty-first century the U.S. Army will no longer face a predictable “massive Soviet-style” air threat.¹¹ Instead, the United States will face a full array of potentially hostile air platforms. FM 44-64 states the air threat “has changed becoming more diverse and stressful.”¹² Even small nations, with the proliferation of inexpensive technology, can pose a credible air threat to Force XXI. The air threat to Force XXI includes unmanned aerial vehicles, cruise missiles,

helicopters, fixed-wing aircraft, and ballistic missiles. Air defense command and control must be capable of meeting this diverse air threat.

Command and Control

Force XXI concepts establish the environment for future divisional air defense command and control. "Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission."¹³ Air defense doctrine advocates centralized control and decentralized execution of divisional air defense operations.¹⁴ Force XXI operational concepts reinforce this method of control.

Information technologies in Force XXI improve the ability to centrally control divisional air defense forces. The Forward Area Air Defense Command and Control System (FAADC2) is a sub-system of the Army Tactical Command and Control System (ATCCS). It "optimizes weapon effectiveness by providing the means for coordinated operational control of FAAD weapons through a data exchange interface among C2 systems."¹⁵ This interface between Force XXI command and control systems provides the air defense commander with situational awareness of all his assets, other divisional units, and enemy ground and air activity. The abundance of timely information, combined with improved communications systems, enable the commander to effectively integrate and coordinate air defense operations for the division.

Centralized control of the divisional air defense operations in the most effective means to get the right air defense assets to the right place to defeat the air threat. With

limited number of air defense assets in the division and an ability to control these assets, centralization is theoretically the optimum method of control. However, extended battlespace and increased tempo of Force XXI operations may require decentralized execution.

As divisional units disperse on the battlefield, air defense forces will be spread over extended ranges to protect divisional units from air attack. One commander cannot be everywhere on the battlefield at once. He cannot effectively make all decisions for these air defense forces. Decentralized execution enables subordinate air defense elements to take the necessary actions “to maximize their individual capabilities and meet the extreme engagement time lines of air and missile threats.”¹⁶ Centralized control and decentralized execution of air defense operations is required in a Force XXI environment.

Strategic and technological changes have altered the environment in which the twenty-first century Army must operate. The Army recognizes that the new environment mandates changes in the way it organizes and operates. Force XXI is the Army’s vehicle for change. Force XXI operational concepts serve as a start point in examining alternative organizations to command and control Force XXI air defense operations.

ORGANIZATION

“In 1942, after the North African invasion, General Jacob Devers, commander of the Armored Command, and General Dwight D. Eisenhower, Operation Torch commander, argued that antiaircraft artillery was needed continuously by ground units.”¹⁷ Despite the continued need for antiaircraft protection of ground forces in World War II,

antiaircraft artillery units never became organic to the United States Army division during the war. However, post-war reviews such as the Infantry Conference's 'Report of Committee "B" on Tactics and Techniques,' eventually led to organic antiaircraft artillery, now called air defense artillery (ADA), units in the division.¹⁸ In the late 1940s and early 1950s air defense units became organic to U.S. Army divisions.¹⁹ Since that time, although the organizations and equipment have changed, an air defense headquarters has served as the command and control center for divisional air defense operations.

This chapter details the structure and functions of the current ADA battalion in the heavy division. This serves as a starting point for examining alternative structures to command and control air defense operations in the FORCE XXI heavy division. The alternative command and control organizations are also discussed in this chapter.

Current ADA Battalion

The mission of the ADA battalion is to provide air defense coverage for the division's critical assets against air and missile attack and surveillance.²⁰ The battalion is commanded by an air defense artillery lieutenant colonel who serves as the air defense coordinator (ADCOORD) for the division. The battalion commander is the principle advisor to the division commander in all air defense-related matters.

The current divisional ADA battalion is the command and control headquarters for all divisional air defense operations, and is the headquarters for all organic air defense assets in the division. The ADA battalion is organized into of five batteries; a headquarters and headquarters battery, three Bradley Stinger Fighting Vehicle (BSFV)

batteries, and an Avenger battery. A diagram of the current heavy division ADA battalion is located in Appendix A.

The headquarters and headquarters battery contains the battalion command group and the administrative and logistical support structure for the battalion. The battalion tactical operations center, manned primarily by the S-2 and S-3 section, is the key command and control node for air defense operations in the division. The headquarters and headquarters battery also contains the battalion sensor platoon.

The battalion has three identically organized BSFV batteries. The organization of the BSFV battery was specifically designed with the capability to support forward maneuver units. Although allocation of the battalion's assets is mission dependent, each of the three BSFV batteries normally supports one of the division's three maneuver brigades.

The additional battery in the heavy ADA battalion is an Avenger battery. The battery was designed with the purpose of providing air defense coverage to the division's rear area assets such as artillery, aviation, logistics, and command and control nodes.

The ADA battalion has a total of seventy-eight air defense weapons systems. With these air defense weapons systems, the ADA battalion commander must provide air defense coverage for the personnel, equipment, and supplies of three maneuver brigades, an aviation brigade, an artillery brigade (DIVARTY), an engineer brigade, a division support command (DISCOM), a cavalry squadron, a signal battalion, and several other company-sized units in the division. The tactical dispersion of the divisional units makes providing effective air defense coverage of the division a complex challenge. A challenge that requires detailed analysis, planning, and sound execution.

Doctrinally, the battalion's command and control mission is separated into force operations and engagement operations. As defined in FM 44-64, "Force operations are the functions required to plan, coordinate, prepare for, and sustain the total air defense mission."²¹ Force operations are sub-divided into a situation analysis function, a planning function, a coordination function. The ADA battalion TOC is the central command and control node for the battalion's force operations. Force operations establish the conditions for engagement operations.

"Engagement operations are those functions required to execute the air, missile, and counter-surveillance battles."²² Engagement operations are focused on the sensor-to-shooter link required to successfully defeat the air threat through surface-to-air battle. The air battle management operations center (ABMOC) is the integrating node for the battalion's engagement operations. Through force and engagement operations, the battalion staff assists the battalion commander in performing his air defense command and control responsibilities for the division.

The responsibilities of the air defense battalion commander, as articulated in FM101-5, are listed in Appendix B.²³ For this study these responsibilities are organized into air defense command and control functions. The air defense command and control functions are: air defense employment, intelligence, early warning, airspace management, targeting, and joint counter-air. These functions identify the air defense command and control requirements which must be performed by the alternative ADA organizations.

Air Defense Employment

The ADA battalion commander is responsible for recommending employment of ADA assets in the division. The ADA battalion commander and his staff use the military decision making process to develop a battalion air defense plan which best supports the division concept of operations. After gaining approval from the division commander or his representative, the ADA battalion allocates assets and assigns missions to subordinate units. Through this centralized process, the battalion develops an integrated air defense plan for the division. However, because air defense weapons systems in the division are a limited resource, not all subordinate units in the division receive dedicated air defense assets.

The ADA battalion commander also recommends active and passive air defense measures for the entire division. His recommended passive and active air defense measures supplement ADA employment in divisional air defense operations.

Intelligence

The ADA battalion commander is responsible for recommending intelligence requirements which support air defense operations and for coordinating intelligence and surveillance of enemy air assets with the division G-2 . The ADA battalion staff identify initial intelligence and support requirements during the battalion's military decision making process. Due to the limited range of the battalion's organic sensors, the battalion is heavily dependent on intelligence from sources outside the battalion regarding enemy air organization, disposition, capabilities, and activities.

Early Warning

The ADA battalion commander is responsible for continuously keeping the division informed of enemy air activity and its impact on division operations. When the location, direction, and speed of enemy air platforms indicate a threat to the division area of operations, the ADA battalion alerts units within the division. The ADA battalion alerts the division through a redundant divisional air early warning system. In order to provide timely air early warning, the battalion tracks enemy air activity with both internal and external sources.

The battalion's sensors, air defense coordination section (ADCS), and ABMOC are critical to providing timely and accurate early warning to the division. The battalion commander and his staff are responsible for planning and managing the employment of the battalion's sensor platoon. The sensor platoon contains the division's only organic air defense sensors. The sensors are critical to division reconnaissance and surveillance operations and air defense operations.

Due to the limited range of the battalion's organic sensors, teams from the ADCS are deployed to external units, with greater range radar, to receive a long-range air picture. The ADCS teams transmit the long range air picture, via voice or digital communications to the ABMOC. The ABMOC correlates the long-range air picture and the short-range air picture, from the battalion sensors, for dissemination to divisional units.

Airspace Management

The ADA battalion commander is responsible for the planning, coordination, and execution of airspace management which impacts divisional air defense operations. This is a shared responsibility with all airspace users. The nature of air defense operations,

denying the enemy's freedom of action in the skies while not interfering with US forces in the air, requires close and constant coordination between U.S. airspace users. The ADA battalion's involvement in this process is critical. The battalion commander and his staff identify air defense airspace requirements and conflicts, recommend airspace control measures to support operations, and disseminate airspace control orders and air tasking orders to subordinate ADA units.

Targeting

The ADA battalion commander recommends counter-air, defensive counter-air, and tactical ballistic missile defense targets and priorities which support divisional air defense operations. An ADA battalion representative, usually the assistant division air defense officer (ADADO), participates in the division targeting meetings in order to ensure offensive counter-air targets are included in the division's targeting process. Targeting recommendations and priorities are based on the ADA battalion S-2's intelligence preparation of the battlefield and analysis of intelligence.

Joint Counter-air

The ADA battalion commander and his staff assist in the development and review of joint counter-air rules and procedures. The ADA battalion commander is division subject matter expert on joint air defense operations. He and his staff must continually review joint counter-air procedures to ensure the procedures support air defense operations in the division.

Prior to discussing the alternative organizations for command and control of divisional air defense operations, the impact of technology on the command and control

functions must be examined. Will technological innovations in Force XXI eliminate any of the command and control functions?

Technological improvements contribute significantly to command and control capabilities, but “while sophisticated equipment is essential, the human factor in command and control is essential.”²⁴ Technology in Force XXI greatly improves the availability of information, but soldiers at all levels must still analyze the available information and make decisions.

None of the divisional air defense command and control areas of responsibility can be eliminated by technology. The ADA battalion commander and his staff must analyze the current situation and anticipate future situations. They make numerous decisions regarding the most effective use air defense assets, intelligence, early warning, airspace management, targeting, and joint counter-air procedures. Technological improvements in Force XXI cannot make these decisions. Technology simply assists the commander and his staff in performing the responsibilities in command and control of air defense operations.

Force XXI ADA Battalion

The organization of the Force XXI ADA battalion is very similar to the current ADA battalion. Technological improvements in both the air defense weapon systems and command and control systems constitute the significant differences between the organizations. An ADA lieutenant colonel commands the battalion, and he remains the principle advisor to the division commander in all matters pertaining to air defense. The battalion structure consists of five subordinate ADA batteries. The Linebacker air defense

weapon system, which replaces the Bradley Stinger Fighting Vehicle, is the significant weapons system improvement. The Forward Area Air Defense Command and Control (FAADC2) system is heart of the improved command and control network for the battalion.

The operational concept of the Force XXI ADA battalion is the same as in the current ADA battalion organization. The ADA battalion is the center of air defense operations for the division. The battalion staff uses the centralized military decision making process to develop the battalion's air defense plan which best supports the division's concept of operation and scheme of maneuver. The subordinate batteries then develop air defense plans for their supported units, ensuring that their plan of support is integrated into the overall battalion plan. The reassignment of air defense command and control functions of Force XXI battalion are located in Appendix B.

Headquarters Replacement

The headquarters replacement alternative replaces the ADA battalion headquarters with an existing brigade headquarters in the division, the aviation brigade. The aviation brigade was chosen for the analysis because the functions involved in aviation operations are similar to those of air defense operations. Air defense operations and aviation operations both deal heavily with the third-dimension of the battlefield, airspace. Command and control of aviation operations includes considerations in many of the air defense command and control areas of responsibility. Air defense employment, intelligence, air early warning, airspace management, targeting, and joint operations are common terms in aviation operations. This organization makes the aviation brigade

commander the functional commander of division air operations. The aviation brigade would serve as the command and control headquarters for air defense operations, as well as the command and control headquarters for aviation operations.

The structure of the headquarters replacement organization would consist of four independent air defense batteries organic to the aviation brigade. A diagram of the organization is located in Appendix A. The organization of the batteries would be similar to the organization under the Force XXI ADA Battalion structure. The sensor platoon would be organic to the Avenger battery, and be task organized according to mission requirements.

The concept of employment for the ADA assets would not be much different than that of the Force XXI alternative. The aviation brigade would conduct the military decision making process in order to develop the most effective air defense concept of operations. The batteries would then be allocated in accordance with the air defense concept of operations. The reassignment of air defense command and control functions in the headquarters replacement organization are located in Appendix B.

Headquarters Elimination

The headquarters elimination alternative eliminates the ADA battalion headquarters. This organization is based on the usual allocation air defense assets to subordinate divisional units. A Linebacker battery is organic to each of the maneuver brigades, and the Avenger battery is organic to the DISCOM. The sensor platoon becomes organic to the Avenger battery, and is task organized based on the tactical situation. An ADA

lieutenant colonel serves as the air defense coordinator (ADCOORD) in the division main command post.

The ADCOORD cell is the central control node for divisional air defense operations. The ADCOORD develops the division's air defense plan, and once approved, issues the plan in division operations order. Subordinate brigades then develop air defense plans, ensuring the plan supports the overall divisional air defense plan. The reassignment of air defense command and control responsibilities in the headquarters elimination organization are located in Appendix B.

This chapter has detailed the structure and functions of the current ADA battalion in the heavy division. The current battalion's organization and responsibilities serve as a foundation in examining alternative structures to command and control air defense operations in the FORCE XXI heavy division. The criteria for evaluating the alternative air defense command and control organizations will be discussed in following chapter.

CRITERIA

The central issue in this study is the effectiveness of alternative organizations in commanding and controlling air defense operations in the heavy division. The criteria for evaluating the effectiveness the alternative organizations are Unity of Command, Unity of Effort, Synchronization, Agility, and Versatility. These criteria serve well as tools for evaluating for command and control structures.

Unity of Command

Unity of command states “ all forces operate under one responsible commander who possesses the requisite authority to direct all forces in pursuit of a common purpose”.²⁵ In a divisional air defense context, unity of command means one commander is given the authority to direct all air defense forces to protect the division from enemy air attack and surveillance.

In order for a commander to effectively direct air defense operations, he must have expertise in air defense operations. FM 22-100 states that tactical and technical proficiency is acquire through professional schooling, operational assignments, professional reading and personal study.²⁶ This study will focus on the commander’s professional schooling and operational assignments as the basis for tactical and technical proficiency. Because personal study and professional reading of individual commanders is too subjective for analysis it will not be discussed. The air defense commander must not only know how to conduct air defense operations, but he must have an organizational structure which facilitates control of air defense operations in the division.

“A one-man Army requires no command, at least not in the sense that a hundred-man Army does.”²⁷ For unity of command, the air defense organizational structure must be such that the commander can effectively control all air defense forces. Technological improvements in Force XXI have undoubtedly increased the ability of the commander to control a greater number of subordinate elements. However, a wide array of air defense missions across the division and the dispersion of air defense elements increases the difficulty of command and control.

Unity of command is essential for divisional air defense operations. Unity of command gives one commander authority over of all air defense resources required to conduct divisional air defense operations. The principle of unity of effort guides the commander to direct these resources toward one common objective.

Unity of Effort

Unity of effort “is the coordination and cooperation among all forces, not necessarily part of the same command structure toward a commonly recognized objective”.²⁸ Air defense operations must support accomplishment of the division’s objectives.

Divisional air defense objectives must be nested with the divisional objectives. Successful air defense protection of the division support area means little if enemy air has destroyed the division’s attacking maneuver brigades. The 1973 Arab-Israeli War provides a extraordinary example of unity of effort between Egyptian air defense and maneuver operations.

During the attack across Suez Canal, the Egyptians demonstrated unity of effort between air defense and maneuver operations. The Egyptians successfully employed an integrated air defense system along the Canal. Air defense employment and objectives supported the Egyptian crossing of the Suez Canal. As the Egyptians crossed the Canal, Egyptian air defenses successfully protected the crossing sites and Egyptian units from Israeli air attack. Israeli aircraft could not penetrate the dense air defense coverage to interdict the crossing. Egyptian air defense objectives, protecting the crossing sites, were nested in the objective of the ground forces, crossing the Canal.²⁹ An air defense

commander and his staff must not only design operations which support maneuver objectives, but must ensure the same unity of effort with air defense forces.

As FM 44-3 states, “air defense units must coordinate with each other to enhance their capabilities and not interfere with each others operations.”³⁰ The missions of all air defense forces must be linked to divisional air defense objectives. Although the divisional air defense units may have different tasks, the purpose of those tasks must support the achievement of the divisional air defense objectives. The air defense command and control headquarters is responsible for directing and coordinating this unified effort.

Due to the limited number of air defense assets in the division, additional air defense assets are usually allocated to the division from corps.³¹ The air defense command and control headquarters must integrate these assets into the coordinated divisional air defense effort.

Synchronization

Air defense operations within the division must not only be designed to achieve a common objective, but they must also be synchronized. The Egyptian successful demonstration of unity of effort in the initial days of the 1973 War was soon overshadowed by their failure to synchronize of air defense and maneuver.

After successfully crossing the Suez Canal under heavy air defense coverage, Egyptian maneuver eastward was not synchronized with air defense coverage. Egyptian maneuver forces soon outran their air defense coverage, and were decimated by a

combination of Israeli air and ground forces.³² Synchronization of air defense operations is a critical command and control function.

Synchronization “is arranging activities in time and space to mass at the decisive point”.³³ Air defense command and control organizations must employ the right number of air defense assets at the right place at the right time to defeat the air threat. They must synchronize air defense operations with the other battlefield operating systems throughout the width, depth, and height of the division’s battlespace.

Airspace management is critical to air defense operations. It ensures the destruction of enemy aircraft and missiles while preventing fratricide and multiple engagements.³⁴ Divisional air defense command and control headquarters must ensure early warning and airspace management are synchronized with air defense operations.

Agility

Agility is the “ability of friendly forces to act faster than the enemy.”³⁵ From a command and control perspective, organizational structure and decision-making processes are keys to acting faster than the enemy. Situational awareness aids command and control headquarters in anticipating changing battlefield conditions. The headquarters can then plan future operations while executing current operations. Agility is not only accomplished through planning. Organizational structure must enable the rapidly shifting of air defense forces to the changing air threat.

Agility requires organizations to have the ability to quickly execute new missions in anticipation of changing conditions on the battlefield. Air defense command and control organizations must be capable of rapidly reorganizing air defense forces and

reorienting air defense operations. “Centralized organizations have definite advantages with respect to speed and decisiveness.”³⁶ Centralized control of air defense forces is required to meet the increased tempo of the Force XXI environment.

Versatility

The United States military is required to perform a great variety of operations from conventional war to operations other than war. Given such requirements, versatility is a critical characteristic of an effective command and control structure. Versatility is the “ability of units to meet diverse mission requirements.”³⁷ From an air defense perspective, the command and control structure must be capable of rapidly transitioning to meet new missions. Air defense organizations must be capable of shifting focus, tailoring forces, and moving from one mission to another rapidly and efficiently. Versatility is required in across the entire spectrum of operations.

In a conventional war the air defense forces must be capable of changing to meet new threats. Air defense forces may be required to rapidly shift from protecting maneuver units in an offensive to providing area coverage in the defense, or vice versa. The air defense command and control headquarters must facilitate these changes. However, versatility on the battlefield is not enough.

Given the diverse range of operations the United States Army conducts, command and control organizations must be structured to conduct an entire spectrum of operations. Since Operation Desert Storm, the United States Army has conducted numerous operations other than war. These operations range from refugee control in Cuba to peacekeeping in Bosnia. Divisional air defense forces must be capable of contributing to

these operations. The command and control structure must be flexible enough to adapt to these changing missions.

Unity of command, unity of effort, synchronization, agility, and versatility are critical characteristics of effective command and control organizations. We will now evaluate the alternative air defense command and control organizations using these criteria.

Analysis

While the analysis of the alternative organizations is subjective in nature, Force XXI operational concepts, U.S. Army doctrine, and historical evidence do provide a basis for analysis. The evaluation criteria discussed in the previous chapter provide the framework to analyze the alternative organizations. The analysis suggests that, in a Force XXI environment, an ADA battalion headquarters still provides the best command and control of divisional air defense operations. The analysis follows:

Force XXI

The Force XXI alternative provides the best command and control of divisional air defense operations. It is better than the other two alternatives in all five criteria; unity of command, unity of effort, synchronization, agility and versatility.

Unity of Command

The Force XXI alternative's centralized control, smaller span of control, and superior air defense expertise make for the best unity of command of the three alternatives. The Force XXI ADA battalion commander has the authority to plan and execute the division's

air defense operations. He also commands all the division's air defense assets. These ingredients, authority and resources, allow the ADA battalion commander to plan and execute air defense operations toward a common purpose- accomplishment of the division objective. This centralized control facilitates unity of command air defense operations.

The span of control of the ADA battalion is the most effective of the three alternatives. The battalion commander's span of control is limited to five subordinate batteries. The battalion commander and his staff develop the divisional air defense plan. The plan is then issued to the battalion's five ADA batteries for execution. Technological improvements in communications and situational awareness make control of these subordinate elements relatively easy for the ADA battalion staff. Although tactical considerations may require the batteries to support other divisional units, the battalion commander maintains unity of command by assigning support relationships.³⁸ An added advantage of this small span of control is the battalion headquarters is fully capable of controlling additional air defense elements reinforcing the division.

The Force XXI organization provides for the most technically and tactically competent commander of divisional air defense forces, the ADA battalion commander. The ADA battalion commander has the necessary technical and tactical expertise to effectively command and control divisional air defense operations. The expertise also enables him to effectively train and develop junior ADA officers. The Army's professional development system allows the ADA battalion commander to develop, over

a sixteen year period, the necessary tactical and technical expertise to command air defense forces in the division.

Air defense professional education courses and tactical assignments fully prepare the ADA battalion commander to perform the air defense command function. Air defense officer basic and advanced courses provide ADA officers with a sound technical and tactical foundation in air defense operations. This education supplements the knowledge an ADA officer acquires in tactical assignments.

The ADA battalion commander has likely served as an ADA platoon leader, executive officer, battery commander, and staff officer. These assignments, coupled with his education at ADA schools, make the ADA battalion commander the division's subject matter expert in air defense operations. This is not the case in the alternative organizations.

Unity of Effort

The Force XXI alternative provides the best unity of effort of the three alternative organizations. The battalion's centralized decision making process ensures unity of effort between air defense and divisional operations and within air defense operations.

The purpose of Force XXI air defense operations is to protect the division from air attack. "If the organization has a clear-cut goal and has to move quickly to achieve it, then some degree of hierarchical control will be critical."³⁹ The centralized structure of the Force XXI alternative provides for unity of effort between air defense and division operations. The ADA battalion commander's control of both air defense assets and air

defense planning ensures air defense operations support achievement of the division's objective.

The ADA battalion commander and his staff develop an air defense plan which is directly linked to divisional objectives. Allocation of air defense assets is based on both the air threat and the division concept of operations.⁴⁰ This provides a firm link between air defense and division operations.

The ADA battalion headquarters' execution of the air defense command and control functions also facilitates unity of effort between air defense and divisional operations. A detailed explanation of how the different headquarters elements perform these command and control functions is located in Appendix B. However, the ADA battalion S-2's reciprocal coordination with the G-2 illustrates the advantage of the ADA battalion staff in achieving unity of effort between air defense and divisional operations.

The battalion S-2 coordinates intelligence and surveillance requirements through the division G-2. This ensures that divisional intelligence operations support air defense operations. He also plans and coordinates ADA sensor integration into the division reconnaissance and surveillance plan. This links the divisional and air defense intelligence effort. The battalion S-2 assists the G-2 with the aerial portion of the intelligence preparation of the battlefield. This too fosters a coordinated effort between air defense and divisional operations. The S-2 section is not the only element in the ADA battalion headquarters which ensures unity of effort in divisional operations, but its responsibilities are indicative of how the headquarters' execution of command and control functions unify air defense and divisional operations.

The ADA battalion staff also provide the necessary command and control structure to ensure unity of effort within air defense operations. The battalion headquarters assigns missions to subordinate air defense elements which are nested in the division air defense plan. The sum of the parts creates an integrated air defense coverage of the division. The battalion headquarters also ensures continued coverage across the division. If a gap is created in the division coverage the battalion headquarters issues the necessary changes to subordinate units.

Synchronization

The Force XXI alternative provides for the best synchronization of the three alternatives. The battalion's centralized structure facilitates synchronization at all echelons of the division. However, the battalion staff's ability to synchronize air defense operations at the division-level is a decided advantage of this alternative.

The ADA battalion synchronizes air defense operations in a top-down manner. The ADA battalion staff first synchronizes air defense operations at the division-level. The staff coordinates air defense operations with other battlefield operating systems during parallel planning with the division's decision making process. The staff's execution of air defense command and control functions enhances synchronization. The ADADO illustrates the advantages of the ADA battalion staff in synchronizing divisional air defense operations.

The ADADO is critical in synchronizing air defense operations at division-level. The ADADO's presence at the division main command post ensures continuous awareness of the division's current and planned operations. He represents the ADA

battalion in the division planning process, airspace management meetings, and targeting meetings. Detailed planning and coordination with all the battlefield operating systems is too consuming for the ADADO to accomplish by himself, so the battalion staff performs the bulk of the synchronization effort. The ADADO provides a direct link to input the staff's efforts into the division's plan. The ADA battalion's synchronization of air defense operations does not end at the division-level.

The battalion's parallel process results in subordinate air defense units receiving missions at approximately the same time the division operations order is published. Subordinate air defense elements, which are tasked to support divisional units, can then fully integrate into the decision making process of their supported unit. This integration ensures synchronization of air defense operations even at the lowest echelons in the division.

Agility

The Force XXI alternative provides the greatest agility in divisional air defense operations for two reasons. First, the ADA battalion staff provides the ability to simultaneously monitor current operations and plan for future operations. Secondly, the battalion commander commands all ADA forces which he can rapidly reorganize and reorient to meet changing battlefield conditions.

The structure of the ADA battalion staff enables the battalion to simultaneously monitor the current fight and plan future operations. This is critical to agility. Subordinate air defense elements may be so involved in the current fight that they cannot effectively anticipate changing conditions on the battlefield. The senior air defense

observer at the National Training Center observed that air defense battery commanders often do not have a good vision of the changing conditions of the battlefield because they are often located with their platoons involved in the current fight.⁴¹ In this alternative the battalion headquarters can relieve subordinate elements of many responsibilities required to anticipate and plan future operations.

When the division begins planning future operations, the ADADO informs the battalion of the division plan. The battalion develops a supporting divisional air defense plans for future operations without significantly impacting the current operations of subordinate batteries. A air defense plan is then available for execution by the time the division issues a fragmentary order to subordinate headquarters.

Because the ADA battalion commander commands all of the air defense assets in the division he can rapidly reorganize and reorient the necessary air defense force to meet a new threat. The battalion commander and his staff know the mission, location, and status of every air defense asset in the division. Because he is focused on the entire division area he knows where he can and cannot accept risk. These factors allow the commander to rapidly assemble and employ the necessary mix of air defense forces to meet changing battlefield conditions.

Versatility

The ADA battalion headquarters provides the greatest versatility to the Force XXI division of the three alternatives for three reasons. First, the battalion has the flexibility to tailor forces for operations. Secondly, the battalion is capable of multiple methods of control of air defense operations. Finally, the battalion headquarters is capable of

operating as an independent command and control headquarters in operations other than war.

Centralized control of all divisional air defense assets allows the ADA battalion to tailor an air defense force with the necessary resources to meet mission requirements. 3-4 ADA's, a divisional ADA battalion, tailoring of air defense forces for Urgent Fury is an example of the ADA battalion's versatility.

3-4 ADA formed a reinforced ADA battery from the battalion's organic assets to support the 82nd Airborne Division in Grenada. A non-standard mix of command and control and ADA weapons systems was formed from the battalion's organic assets.⁴² The battalion's ability to tailor the ADA force meant that only the necessary assets were sent to accomplish the mission. Excessive ADA assets, which would have consumed divisional resources, were not deployed.

The ADA battalion is capable of simultaneously performing both centralized and decentralized execution of air defense operations. The battalion can assign missions and support relationships to subordinate air defense elements to provide mobile air defense coverage for maneuver units in the offense. The battalion is also capable of retaining control of all divisional air defense forces in order to provide an area coverage of the division in the defense. The diverse range of Force XXI operations may require a combination of both centralized and decentralized execution. The ADA battalion is capable of controlling both.

The ADA battalion headquarters provides the greatest versatility to the division in operations other than war. The ADA battalion headquarters gives the division an

additional battalion-level command and control headquarters. 1-3 ADA's, a divisional ADA battalion, participation in Operation Sea Signal illustrates the versatility of the ADA battalion headquarters in operations other than war.

In 1995, 1-3 ADA Battalion served as the security force for Cuban migrant camps in Guantanamo Bay.⁴³ Rather than the 3rd Infantry Division having to send one of its maneuver battalions to perform this mission, the command and control capability of the ADA battalion headquarters provided a viable alternative. The existence of an ADA battalion headquarters provides the division with additional versatility in operations other than war.

Headquarters Replacement

The Replacement alternative provides the second best alternative for command and control of divisional air defense operations. This alternative is the second best in all of the evaluation criteria. The Replacement alternative, like the Force XXI alternative, has the advantage of centralized control of ADA forces and air defense operations. However, the deciding disadvantage of this alternative is an insufficient staff to effectively perform both air defense and aviation command and control functions.

The staff of the aviation brigade must perform both air defense and aviation command and control functions. However, the staff does not have the necessary manpower to perform both of these functions effectively. The brigade operations section provides the best example. The operations section consists of four officers; the S-3, assistant S-3, S-3 air, and the tactical air operations officer. Each officer's aviation command and control responsibilities are extensive.⁴⁴ Adding air defense command and

control functions to existing aviation responsibilities would reduce their effectiveness. While this may appear to be a subjective assessment, a 10th Mountain Division initiative supports the assessment.

The 10th Mountain Division recently integrated their air defense battalion and aviation brigade tactical operations centers. While the initiative has provided some definite advantages, “both the 10th Avn. Bde. and the 3-62 ADA discovered that the AVADTOC does not save man-hours and thus warrant reduction in manpower.”⁴⁵

Because this study is examining the necessity of the ADA battalion headquarters it would be illogical to simply merge the air defense battalion headquarters into aviation brigade. The analysis of this alternative is thus based on the existing structure of aviation brigade staff.

Unity of Command

The span of control of the Replacement organization is too great for effective command and control. The aviation brigade, with a relatively small staff, must control two aviation battalions and four independent ADA batteries. Control becomes even more difficult if additional air defense forces reinforce the division. The ADA and aviation units are displaced across the entire division area of operations. This creates a difficult command and control environment. Because they conduct operations independently of one another the staff must focus in many different directions simultaneously. While aviation brigade is conducting deep attacks, air defense forces may be engaging unmanned aerial vehicles in the division rear area. The aviation brigade cannot control

the operations of four independent ADA batteries and two aviation battalions as effectively as the Force XXI ADA battalion can control five ADA batteries.

The aviation brigade commander and his staff do not have the necessary air defense tactical and technical expertise to effectively command and control divisional ADA forces and operations. Aviation professional education courses do not provide the necessary foundation for expertise in divisional air defense operations. Additionally, during career progression, aviation officers are not assigned to divisional air defense units. The aviation brigade commander and his staff, therefore, do not have the necessary air defense expertise to command and control divisional air defense operations. The aviation brigade commander also does not have the expertise to train and develop his junior ADA officers. ADA battery commanders, with as few as four years of service, provide the extent of air defense expertise in this alternative. Even the ADCOORD in this alternative, who may be senior in rank, has never commanded above the battery-level.

Unity of Effort

Similar to the Force XXI alternative, the aviation brigade's centralized control of air defense forces and operations is an advantage in unity of effort. However, the small staff's inability to effectively perform air defense command and control functions marks the difference between the organizations.

The aviation brigade commander and his staff develop an air defense plan for the division. The aviation brigade commander also commands all the air defense assets to execute the divisional air defense plan. This provides a solid bond between air defense

and division operations. However, this alternative does not have the necessary staff to ensure unity of effort of air defense operations.

Unity of effort of air defense operations requires extensive coordination in performance of the air defense command and control functions. As previously discussed, the brigade does not have the necessary staff to effectively perform these functions in addition to their aviation functions.

Synchronization

The aviation brigade's centralized control of air defense operations and assets provides an advantage in synchronizing divisional air defense operations. This synchronization advantage was discussed in detail in the Force XXI alternative. However, this alternative has two significant differences. First, the alternative has a better capability synchronizing air defense and aviation operations. Secondly, and most importantly, the aviation brigade does not have the necessary staff to synchronize air defense operations with maneuver or combat service support operations.

Because the aviation brigade is responsible for both divisional air defense and aviation operations airspace management can be accomplished in one headquarters. The advantage is efficiency. Rather than two separate headquarters developing plans and then de-conflicting airspace, the aviation brigade can develop air defense and aviation plans which best synchronize air defense and air operations. Also, airspace issues which arise during operations can be resolved by one headquarters in a more timely manner.

In theory this makes the aviation brigade appear to be a better alternative than the Force XXI organization for synchronizing air defense operations. However, the fact is

that the aviation brigade does not have the manpower to perform the necessary synchronization functions. The evidence, again, is provided by the 10th Mountain Division initiative.⁴⁶

Agility

The centralized control of air defense operations and forces in the Replacement alternative provides a similar ability to quickly reorganize and reorient air defense forces to a changing threat. However, the brigade staff's requirement to control both aviation and air defense operations will likely increase the time required to identify changing air defense battlefield conditions. The staff will also require more time to reorganize air defense forces and reorient air defense operations to meet the new conditions. Aviation doctrine provides the evidence. FM 1-111 states that when the aviation brigade is formed into an air-ground task force it has problems "developing a fully integrated and synchronized plan in a relatively short amount of time."⁴⁷

The aviation brigade staff is under-manned to simultaneously monitor current operations and plan future operations for both air defense and aviation forces. The aviation brigade can reorganize ADA forces and reorient air defense operations to meet a changing battlefield conditions. However, the process likely would not as timely as in the Force XXI alternative.

Versatility

The aviation brigade's centralized control of divisional air defense assets enables the brigade commander to tailor the air defense force to meet mission requirements in war and operations other than war. Because the commanders owns all the air defense assets

he can form the necessary mix of air defense assets to accomplish a wide range of air defense assets. However, the disadvantage of this alternative is that the same staff is used to command and control air defense and aviation assets. When only air defense forces are required for an operation, as in 1-3 ADA's support of the of the 1996 Olympic games a portion the brigade's headquarters is required to command and control the ADA forces.⁴⁸ Command and control capability for the brigade's aviation operations is thus reduced.

As discussed in the Force XXI alternative, the existence of permanent air defense command and control headquarters allows flexibility in the methods of control of divisional air defense operations. However, as previously discussed centralized control of all air defense assets would exceed the brigade's effective span of control. The Force XXI alternative is more versatile in using various methods of air defense command and control because air defense is its sole function.

Elimination

The Elimination alternative provides for the least effective command and control of divisional air defense operations. The primary weakness of this organization is that four separate brigades command and control air defense forces and operations. This decentralized control adversely impacts each of the five criteria.

Unity of Command

The Elimination alternative provides for ineffective air defense unity of command for two reasons. First, the division has an ineffective span of control of air defense forces and operations. Secondly, the air defense commanders do not have the necessary air defense technical and tactical expertise to command and control air defense operations.

In this alternative the span of control of divisional air defense operations is increased at least three-fold. The division commander must control air defense operations through four separate brigade commanders. Span of control is further increased when ADA coverage is required in locations other than those of the four brigades. Separate ADA elements may be required to cover air avenues of approach or assets away from the brigades. When this occurs the division's span of control of air defense forces rapidly increases beyond its capability to effectively provide it. At the brigade-level, span of control of air defense operations is more effective.

The brigade commanders have one subordinate commander responsible for air defense operations. The ADA battery commander develops the air defense plan for the brigade. He then executes air defense operations with his organic assets. In the elimination alternative span of control of air defense forces is efficient at brigade level, but too cumbersome at division level.

The commanders of air defense forces in this alternative do not have the air defense tactical and technical expertise to effectively command divisional ADA forces. The reason, as discussed in the Replacement alternative, is that professional education courses and career progression do not provide these commanders with the knowledge and experience required for expertise. The proponent for air defense training at the United States Army Infantry School states that infantry officers only receive a total of approximately five hours of air defense instruction from officer basic school through brigade pre-command course.⁴⁹ The lack of air defense education coupled with the lack

of assignments in divisional ADA units provides for insufficient air defense tactical and technical expertise in this alternative.

Unity of Effort

In the Elimination alternative, decentralized control of air defense forces can lead to a disjointed divisional air defense coverage. Because task organization of air defense assets takes place before the division's mission analysis the effectiveness of air defense coverage for the division is degraded. The senior air defense observer at the National Training Center observed that pre-established task organizations often leads to air defense coverage in the wrong place at the wrong time.⁵⁰ Allocation of air defense assets must be based on sound analysis for each division operation.

An additional disadvantage of this organization is that there is no controlling headquarters for the separate air defense units. This violates ADA employment principle of integration. FM 44-64 states that air defense units "must coordinate with each other to enhance their capabilities, and must not interfere with each other's operations".⁵¹ Although the battery commander's may be held responsible for this coordination, the command structure in this alternative does not facilitate unity of effort between air defense operations.

Synchronization

"Commanders of neither large nor small units can visualize the battlefield and direct and synchronize the efforts of their units from a computer screen at the command post."⁵² This quotation addresses the major disadvantage of synchronizing air defense operations in the Elimination alternative. In this alternative the responsibility of division-level air

defense synchronization rests in the hands of a staff officer, the ADCOORD. He is not a commander, and he commands none of division's air defense forces. He must synchronize divisional air defense operations from his cell in the division main command post.

The ADCCORD must synchronize the division air defense plan with the other divisional battlefield operating systems. He must also ensure continual synchronization of air defense operations during execution without any command authority. These two tasks would challenge the ADCOORD in and of themselves, but unlike the Force XXI alternative, there is no staff to perform the divisional air defense command and control functions. The small ADCOORD section cannot effectively perform the many command and control responsibilities required to synchronize divisional air defense operations.⁵³ This alternative does have the advantage of better synchronization of air defense operations within each brigade.

Because an air defense battery is a permanent member of the brigade team air defense synchronization within the brigades is enhanced. The brigade commander and his staff will standardize tactics, techniques, and procedures which integrate air defense operations. Improved coordination between air defense and the brigade's other battlefield operating systems will result from this habitual relationship. Unfortunately, air defense operations must also be synchronized at the division-level to ensure air defense forces are in the right place at the right time to defeat the air threat.

Agility

The Elimination alternative provides the least agility of the three organizations. The small ADCOORD section has too many responsibilities to identify changing battlefield conditions and anticipate air defense requirements in a timely manner. When the ADCOORD does recognize that a change to the air defense plan is necessary, he does not have the authority to immediately reorient and reorganize subordinate air defense forces. He must first get approval from the division commander or his representative. Because the air defense assets belong to four separate brigade commanders, reorganizing and reorienting air defense forces would be time consuming.

Versatility

The Elimination alternative does not provide for versatility in divisional air defense operations. Air defense assets are organic to brigades within the division. Several brigades may be disrupted in order to get the necessary mix of air defense assets for an operation.

Another disadvantage in this organization is air defense operations are limited to decentralized control. There is no headquarters to centrally command and control divisional air defense operations. Because of the limited number of air defense assets in the division centralized control is often a more effective method of air defense employment. The Elimination alternative provides the least versatility in the command and control of divisional air defense operations in war.

The Elimination alternative eliminates a battalion-sized command and control headquarters in the division. The division thus has one less potential command and

control headquarters for any operation other than war. The division's versatility in operations other than war is diminished in this alternative.

CONCLUSION

Political and technological developments have altered the battlefield environment as the United States Army enters the new millennium. The Army must carefully examine what changes are required, in any, to meet these changing conditions. Tactical units must be able to fight and win on the conventional battlefield. They must also be capable of successfully operating in operations other than war.

Although "flattening" of organizations is a currently receiving much attention, it is not the only answer to designing military organizational structures for the twenty-first-century. Organizational structures must be efficient, but they must also be effective. Eliminating intermediate command and control headquarters for the mere sake of reducing size is imprudent. Carefully analysis of the alternatives is required prior to deciding to remove an intermediate headquarters. The ADA battalion headquarters provides an clear example of an intermediate headquarters which should not be eliminated.

The ADA battalion headquarters provides for better command and control of divisional air defense operations than headquarters replacement or elimination alternatives. The ADA battalion headquarters provides the unity of command, unity of effort, synchronization, agility, and versatility required for success in twenty-first century military operations.

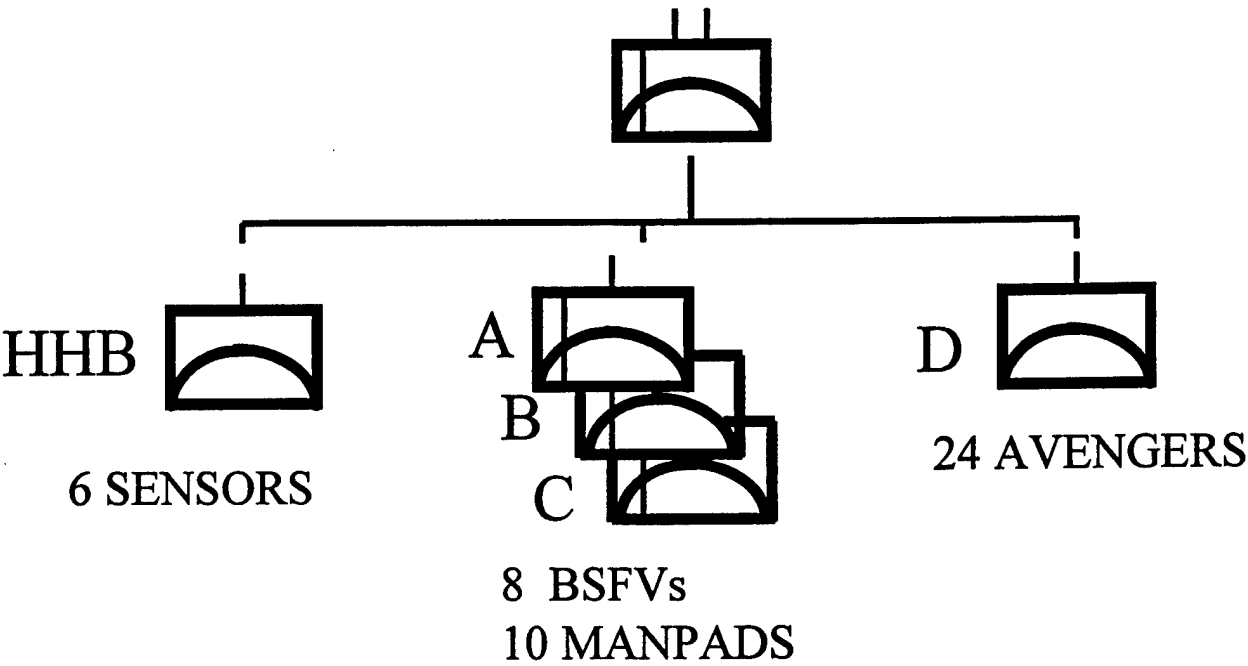
The Force XXI ADA battalion is the one single headquarters responsible for all divisional air defense operations. All forces work for one commander, who determines how to best employ the limited air defense assets in pursuit of the division's objectives. The battalion headquarters possesses the staff and resources to perform the necessary air defense command and control functions. The centralized command and control headquarters allows synchronization of air defense operations at all levels of the division. The battalion's centralized command and control also allows agility of air defense operations.

The ADA battalion staff provides a command and control headquarters which can simultaneously monitor current operations and plan for future operations. The staff can effectively monitor the current fight of the subordinate batteries and anticipate new actions required to meet the changing conditions on the battlefield. The battalion staff can then plan for future air defense operations. Because the battalion commander owns all air defense forces he and his staff can rapidly reorganize and reorient the necessary mix of assets to meet the changing conditions of the battlefield. Efficient reorientation and reorganization of forces increases agility and versatility in divisional air defense operations.

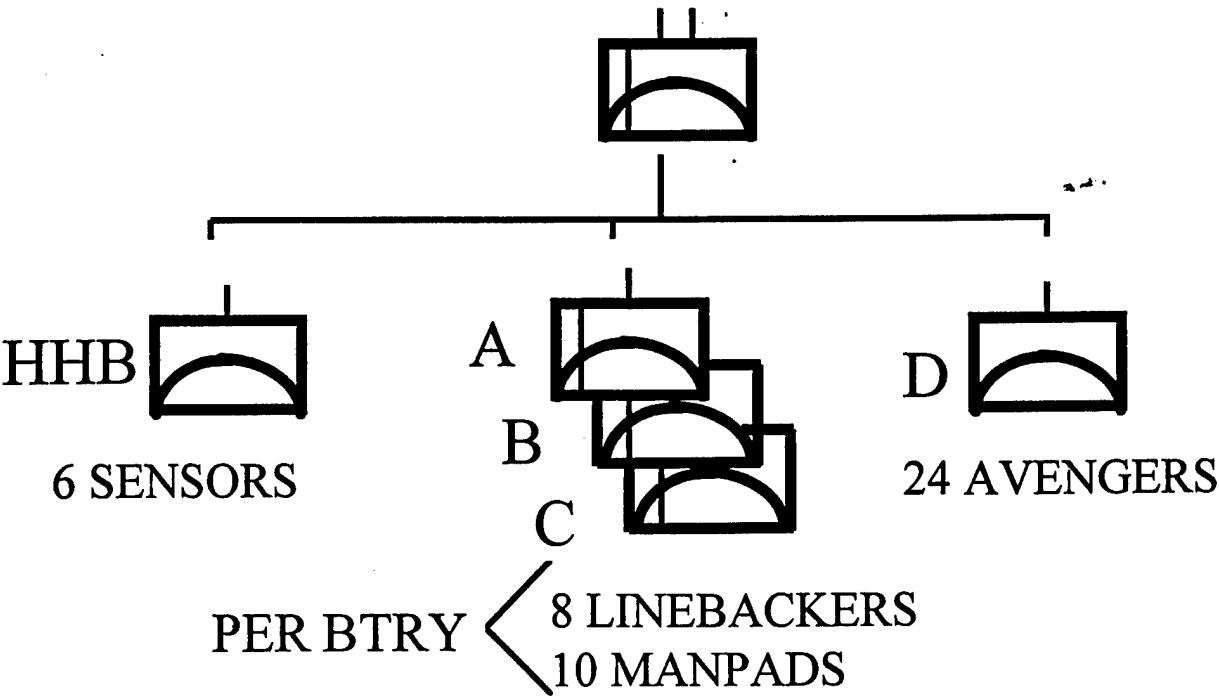
Existence of an ADA battalion headquarters provides the division with versatility in both war and operations other than war. The battalion headquarters has the capability to control centralized or decentralized execution of air defense operations, as required by the situation. The battalion also provides the division with an additional command and control headquarters for operations other than war.

Eliminating the ADA battalion headquarters simply to follow the current trend of “flattening” organizations would be an imprudent decision. The readiness of the heavy division and the United States Army would be significantly degraded. This work shows that the battalion headquarters is best alternative for successful command and control divisional air defense operations. Training, administrative, and logistical considerations were not considered due to the scope of the study. However, they too require critical analysis prior to removing the headquarters.

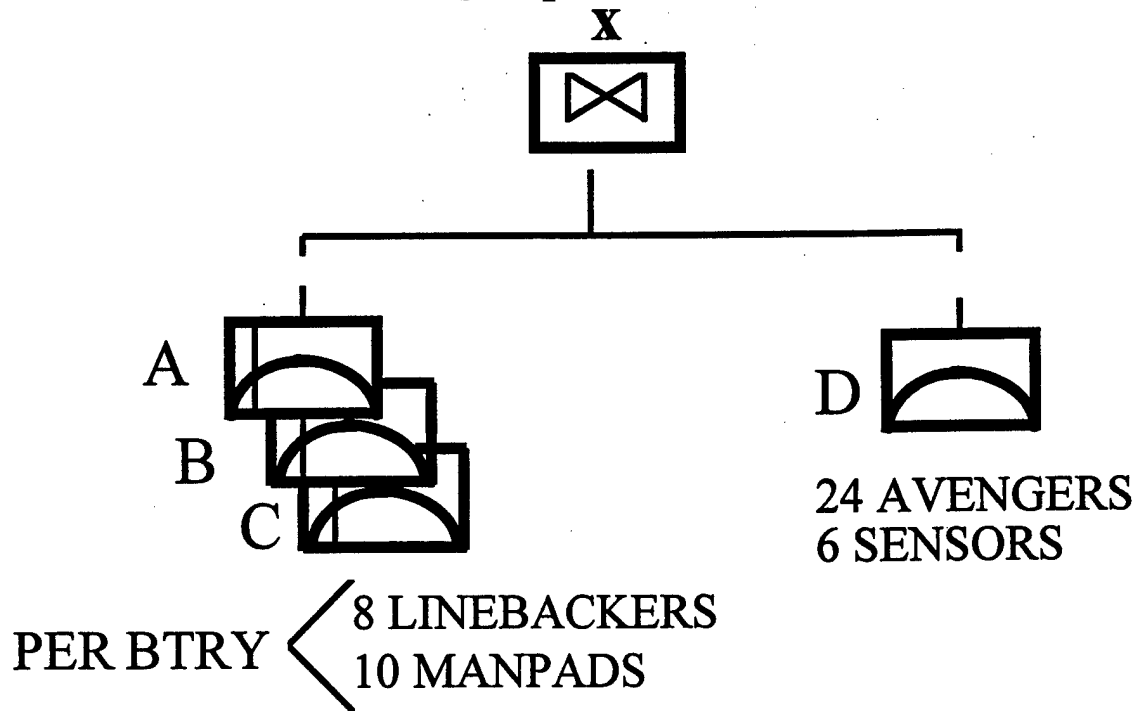
Current ADA Battalion



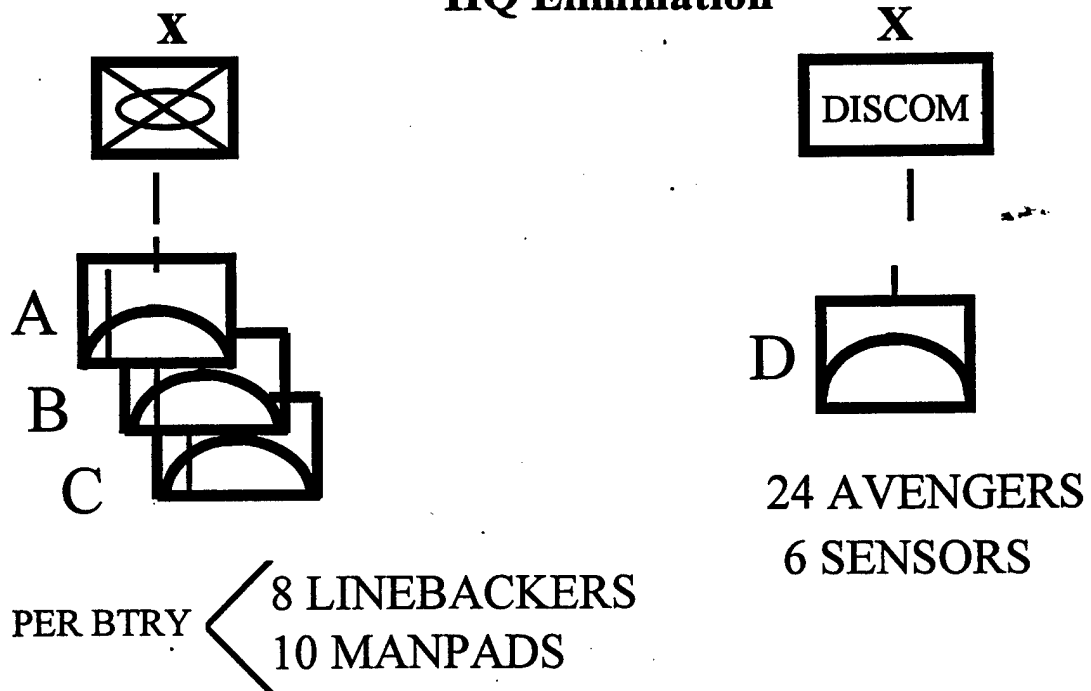
Force XXI Battalion



HQ Replacement



HQ Elimination



APPENDIX B: Air Defense Command and Control Functions

Air Defense Command and Control Functions⁵⁴

FORCE XXI

Air Defense Employment

- **Determine requirements and recommend use of assets to support air defense efforts.** The battalion headquarters is the focal point of this responsibility. The battalion staff conducts a centralized planning process to develop an integrated air defense concept of operations in support of division's operations. The ADADO is a vital link the battalion and division. He keeps the battalion informed of future division operations.
- **Recommend division passive and active air defense measures.** The ADA battalion commander and his staff recommend both passive and active air defense measures for the division. In his absence, the ADADO performs this function.

Intelligence

- **Recommend intelligence requirements to the G2 through the G3.** The ADA battalion S-2 and S-3 identify intelligence requirements during the planning process. The staff then forwards the requirements to the division G-2 through the G-3. The ADADO, due to his location in the division main command post, may assist in this process.
- **Coordinate with the G2 to ensure surveillance and intelligence units locate enemy air support assets.** In the Force XXI ADA battalion organization, the ADA battalion S-2 is tasked with being an expert in the division on the enemy's air capability. The ADA Battalion S-2 remains a critical asset to the division by assisting the G-2 with the divisional aerial portion of the intelligence preparation of the battlefield. The S-2 coordinates surveillance and intelligence on the enemy's air assets, facilities, and activities.

Early Warning

- **Advise the division commander and staff on impact of early warning on air defense operations.** The ADA battalion commander, and the ADADO in the commander's absence, advise the division commander and his staff on the impact of early warning on air defense operations. The ADA battalion staff, through continuous monitoring and processing of battlefield information, provides the battalion commander with an assessment of early warning.
- **Coordinate air defense sensor management.** The ADA Battalion S-2 and S-3 develop a sensor management plan which supports the division concept of operations, division reconnaissance and surveillance plan, and air defense operations.
- **Provide Early Warning to the Division.** The ADA battalion is responsible for providing continuous updates of enemy air activity to the division. The ABMOC is the central node of the division's early warning. The ABMOC receives air pictures from both internal and external sources and disseminates the early warning to the other divisional units through the ATCCS.

The subordinate air defense units are responsible for updating their supported units with the air early warning. Subordinates air defense units can also accomplish this through ATCCS. However, redundant voice air early warning, when enemy air attack is imminent, can reduce the risk of a surprise enemy air attack on divisional units.

Airspace Management

- **Plan and coordinate airspace with the aviation liaison officer, Air Force Liaison Officer, Fire Support Coordinator, G-3 air, and other airspace users. Provide air defense input to the division Army Airspace Command and Control plan.** The ADA battalion staff is responsible for coordinating and deconflicting airspace requirements. The structure of ADA Battalion allows accomplishment of this functions at all echelons. ADA platoons and batteries can plan and coordinate airspace requirements with other airspace users at their echelon and then forward the requirements through the air defense chain of command. The ADADO is part of the Army Airspace Command Control cell. He ensures the battalion's issues and requirements are resolved in a timely manner.
- **Request immediate airspace control measures to support air defense operations.** The same multi-echelon approach discussed above applies requesting and coordinating airspace control measures.
- **Disseminate Air Tasking Order and Airspace Control Order to subordinate air defense artillery units.** When the division receives ATOs and ACOs, the ADADO forwards the orders to the battalion TOC. The TOC then disseminates the orders to subordinate air defense units. The orders are also disseminated by the division to other subordinate units in the division chain of command. Air defense units at all echelons assist their supported force in the interpretation, understanding, and the integration of these orders.

Targeting

- **Participate in division targeting meetings and recommend offensive counter-air, defensive counter-air, and tactical ballistic missile defense targets and priorities based on air and missile capability assessment.** The ADADO participates in the division targeting meetings in order to ensure offensive counter-air targets are included in the targeting process. The battalion S-3 and S-2 provide the critical analysis for the ADADO's input into the targeting meeting.

Joint Counter-air

- **Help develop and review joint counter-air rules and procedures.** The ADA battalion commander and his staff are tasked with being the experts on joint air defense operations. The battalion commander and S-3 ensure joint counter-air rules and procedures support the divisional operations. They are responsible recommending changes to existing rules and procedures, if necessary.

Headquarters Replacement Air Defense Command and Control Functions

Air Defense Employment.

- **Determine requirements and recommend use of assets to support air defense efforts.** The aviation brigade headquarters is the center for the division's air defense planning. Once the division begins the planning process the ADADO plays a critical role of continually keeping the brigade informed of the division planning process. The aviation brigade determines the requirements for air defense protection and develops an air defense concept of operations for the division. Once the division commander approves the concept of operations, the aviation brigade allocates resources and assigns missions to subordinate air defense units.
- **Recommend division passive and active air defense measures.** The aviation brigade commander recommends both passive and active air defense measures throughout the division. Once the recommended measures are approved by the division commander, they would be written into the division operations order .

Intelligence

- **Recommend intelligence requirements to the G2 through the G3.** The aviation brigade S-2 and S-3 identify air defense intelligence requirements during the planning process and forward them to the division G-2 through the G-3.
- **Coordinate with the G2 to ensure surveillance and intelligence units locate enemy air support assets.** The aviation brigade S-2 is given the additional responsibility of being one of the division's experts on enemy air capability. He must have the necessary expertise on enemy aerial platforms, organization, and doctrine. He also assist the division G-2 in the aerial portion of the intelligence preparation of the battlefield.

Early Warning

- **Advise the division commander and staff on impact of early warning on air defense operations.** The aviation brigade commander and his staff are responsible assessing the capabilities and limitations of organic and external sources of air early warning. The commander must then analyze the impact of early warning on divisional operations, and keep the division commander informed.
- **Coordinate air defense sensor management.** The aviation brigade S-2 and S-3 develop a sensor management plan which supports the division concept of operations, division reconnaissance and surveillance plan, and support air defense operations. They must continually monitor the current situation to ensure maximum effectiveness of the organic sensors.
- **Provide Early Warning to the Division.** The aviation brigade is responsible for providing continuous updates of enemy air activity to all subordinate elements within the division. The aviation brigade uses a similar process to disseminate air early as that of the Force XXI ADA battalion, but has no ABMOC. Additionally, FAADC2 equipment is required in the aviation brigade to accomplish this function.

Airspace Management

- **Plan and coordinate airspace with the aviation liaison officer, Air Force Liaison Officer, Fire Support Coordinator, G-3 air, and other airspace users. Provide air defense input to the division Army Airspace Command and Control plan.** The aviation brigade staff would be responsible for identifying requirements and coordinating airspace for air defense operations. The aviation brigade is already heavily involved in the airspace management process.
- **Request immediate airspace control measures to support air defense operations.** The aviation brigade is responsible for requesting airspace control measures to support air defense operations. The brigade already plays a major role in the airspace control measure process.
- **Disseminate Air Tasking Order and Airspace Control Order to subordinate air defense artillery units.** The aviation brigade is responsible for disseminating the ATO and ACO to subordinate air defense elements, as well as subordinate aviation elements.

Targeting

- **Participate in division targeting meetings and Recommend offensive counter-air, defensive counter-air, and tactical ballistic missile defense targets and priorities based on air and missile capability assessment.** The aviation brigade is represented at the division targeting meetings. Inclusion of offensive counter-air targets in the targeting process is now an added responsibility. Based on the aviation brigade S-2's IPB and analysis of intelligence, the aviation brigade requests targeting on critical enemy air assets.

Joint Counter-air

- **Help develop and review joint counter-air rules and procedures.** The aviation brigade commander and staff become the divisional experts on joint air defense operations. The ADADO assists in the process of developing and recommending changes to the joint counter-air rules and procedures.

Headquarters Elimination

Air Defense Employment.

- **Determine requirements and recommend use of assets to support air defense efforts.** The ADCOORD section would be the center for the division's air defense planning. The ADCOORD is responsible for incorporating air defense planning into the division planning process. The divisional air defense concept of operations is included in the division operations order for execution by the DISCOM and three maneuver brigade commanders.
- **Recommend division passive and active air defense measures.** The ADCOORD recommends both passive and active air defense measures throughout the division. Once approved by the division commander, the active and passive air defense measures are included in the division operations order for execution by all divisional units.

Intelligence

- **Recommend intelligence requirements to the G2 through the G3.** The ADCOORD, assisted by the G-2, recommends intelligence requirements. The G-2 no longer has the expertise of the ADA battalion S-2 to assist in the aerial portion of the intelligence preparation of the battlefield. This is now an additional task for the G-2.
- **Coordinate with the G2 to ensure surveillance and intelligence units locate enemy air support assets.** The ADCOORD and division G-2 ensure proper surveillance on the enemy's air capability. Again, this is an additional requirement for the G-2.

Early Warning

- **Advise the division commander and staff on impact of early warning on air defense operations.** The ADCOORD identifies the capabilities and limitations of internal and external early warning sources, none of which he has command authority over. Then he assesses the impact of early warning on air defense operations and keeps the division commander and staff informed.
- **Coordinate air defense sensor management.** The ADCOORD develop a sensor management plan which supports the division concept of operations, division reconnaissance and surveillance plan, and support air defense operations. The Avenger battery commander then executes the sensor plan.
- **Provide Early Warning to the Division.** The ADCOORD is responsible for providing continuous updates of enemy air activity to all subordinate elements within the division. The ADCOORD relies on the FAADC2/ATCCS link to ensure the division has continuous air early warning. There is no longer an ABMOC, so the ADCOORD must also perform its responsibilities.

Airspace Management

- **Plan and coordinate airspace with the aviation liaison officer, Air Force Liaison Officer, Fire Support Coordinator, G-3 air, and other airspace users. Provide air defense input to the division Army Airspace Command and Control plan.** The ADCOORD is responsible for planning and coordinating air defense airspace management. He receives input from the DISCOM and maneuver brigades.
- **Request immediate airspace control measures to support air defense operations.** The ADCOORD receives requests for immediate airspace control measures from the DISCOM and maneuver brigades. He provides the requests to the division A2C2 cell.
- **Disseminate Air Tasking Order and Airspace Control Order to subordinate air defense artillery units.** The ADCOORD disseminates ATOs and ACOs to the maneuver brigades and DISCOM via ATCCS.

Targeting

- **Participate in division targeting meetings and Recommend offensive counter-air, defensive counter-air, and tactical ballistic missile defense targets and priorities based on air and missile capability assessment..** The ADCOORD participates in the division targeting meetings in order to ensure offensive counter-air targets are included in the targeting process. Based on the G-2's aerial portion of the intelligence preparation of the battlefield, analysis of intelligence, the ADCOORD, requests targeting on critical enemy air assets.

Joint Counter-air

- **Help develop and review joint counter-air rules and procedures.** The ADCOORD is the division's expert on joint counter-air operations. He develops and recommends necessary changes to ensure effective divisional air defense operations.

ENDNOTES

¹ Douglas A. Macgregor, Breaking the Phalanx, (West Port, CT: Preager Publishers, 1997). The author suggests replacing the division with smaller, more independent, combat groups.

² A National Security Strategy for a New Century, (Washington D.C.: The White House, October 1998), p. 1.

³ U.S. Army Training and Doctrine Command, TRADOC Pamphlet 525-5, Force XXI Operations, (Fort Monroe, VA, August 1994), p. 1-2.

⁴ Ibid., p. 1-5.

⁵ Ibid., p. i.

⁶ U.S. Army, FM 101-5-1, Operational Terms and Graphics, (Washington D.C.: HQDA, September 1997), p.1-18.

⁷ TRADOC Pamphlet 525-5, p. 3-3.

⁸ General William Hartzog, Commander, U.S. Army Training and Doctrine Command, News Briefing on the Army's Redesign of Divisions, 9 June 1998. General Hartzog stated that the Force XXI division area of operations has increased by approximately two and a half times, 100X100kms to 120X200kms.

⁹ FM 101-5-1, p.1-153.

¹⁰ TRADOC Pamphlet 525-5, p. 2-5.

¹¹ U.S. Army, FM 44-100-2, Air Defense Artillery Reference Handbook, (Washington D.C.: HQDA, 1992), p. 2-1.

¹² U.S. Army, FM 44-64, SHORAD Battery and Battalion Operations, (Washington D.C.: HQDA, June 1997), p. B-1.

¹³ FM 101-5-1, p.1-33.

¹⁴ U.S. Army, FM 44-100, US Army Air Defense Operations, (Washington D.C.: HQDA, June 1995), p 5-9.

- ¹⁵ FM44-100-2, p. 3-79.
- ¹⁶ FM 44-100, p 5-9.
- ¹⁷ Frank J. Caravella, First to Fire, (Fort Bliss, Texas: OCADA, 1995), p.9.
- ¹⁸ The Infantry Conference, 'Report of Committee "B" on Tactics and Techniques', (Fort Benning, GA: June 1946), Section T-29, pp. 1-8.
- ¹⁹ U.S. Army Air Defense Artillery School, ADA Regimental Handbook, (Fort Bliss, Texas: 1987), p. 55.
- ²⁰ FM 44-64, p.1-6
- ²¹ Ibid., p. 2-3.
- ²² Ibid., p. 2-2.
- ²³ U.S. Army, FM 101-5, Staff Organization and Operations, (Washington D.C.: HQDA, June 1997), p. 4-22.
- ²⁴ Raymond C. Bjorklund, The Dollars and Sense of Command and Control, (Washington D.C.: National Defense University Press, 1995), p. 12.
- ²⁵ FM 101-5-1, p. 1-159.
- ²⁶ U.S. Army, FM 22-100, Military Leadership, (Washington D.C.: HQDA, June 1990), p. 6.
- ²⁷ Martin van Crevald, Command in War, (Cambridge, MA: Harvard University Press, 1985), p. 6.
- ²⁸ FM 101-5-1, p.1-159.
- ²⁹ Anthony H. Cordesman and Abraham R. Wagner, Lessons of Modern War: Volume I, (London: Mansell Publishing Limited, 1990), pp. 73-93.
- ³⁰ U.S. Army, FM 44-3, Air Defense Artillery Employment Chaparral/Vulcan/Stinger, (Washington D.C.: HQDA, June 1984), p. 6-4.
- ³¹ FM 44-64, p. 1-6.

³² Chaim Herzog, The Arab- Israeli Wars, (New York: Vintage Books, June 1984), p256. as cited in The Lessons of Modern War, Volume I, p. 101.

³³ U.S. Army, FM 100-5, Operations, (Washington D.C.: HQDA, June 1993), p. 2-8.

³⁴ FM 44-100, p. 5-10.

³⁵ FM 100-5, p. 2-7.

³⁶ Francis Fukuyama and Abram Schultsky, The Virtual Corporation and Army Organization, (Santa Monica, CA: Arroyo Center, RAND, 1997), p.19.

³⁷ FM 100-5, p. 2-9.

³⁸ FM 44-64, p. 2-6.

³⁹ Francis Fukuyama and Abram Schultsky, p. 19.

⁴⁰ FM 44-100, p. 6-16.

⁴¹ Captain Todd Morrow, "NTC Trends," ADA, September-October 1995, pp. 14-15.

⁴² Captain James L. Collins and Captain David M. Casmus, "Air Defense in Grenada, Air Defense Artillery, Spring 1984, pp. 13-15.

⁴³ Major David L. Mann, "Maintaining Readiness in OOTW", ADA, March-April 1996, pp. 37-43.

⁴⁴ U.S. Army, FM 1-111, Aviation Brigades, (Washington D.C.: HQDA, October 1997), p. 2-7. Responsibilities are as follows: The section is headed by the S-3. He runs the overall operations section of the brigade. His is tasked with planning and coordinating combined arms operations across the width and depth of the battlefield and directing A2C2 functions for the aviation brigade. His assistants are the assistant S-3, the tactical operations officer, and the S-3 air. The assistant S-3 performs the responsibilities of the S-3 in his absence. The tactical operations officer coordinates, prioritizes, plans, schedules, assigns, briefs, and monitors approved aircraft missions to subordinate units. The S-3 air is the principle advisor in coordinating joint air support operations for the aviation brigade. He may also serve as the brigade's plans officer.

⁴⁵ First Lieutenant William H. Patrowicz Jr., "The Aviation-Air Defense TOC in the 10TH Mountain Division", Army Aviation, December 1997, pp. 17-20.

⁴⁶ Ibid., pp. 17-20.

⁴⁷ FM 1-111, p. A-9.

⁴⁸ Major Dave Bagnatti, "1-3 ADA Medals at the Olympics", ADA, April-May-June 1997, pp. 44-48. 1-3 ADA formed a task force to assist U.S. customs in detecting aerial threats to Olympic activities. The task force consisted of 43 soldiers from Headquarters and Headquarters Battery, 1-3 ADA and 12 soldiers from 3rd Signal Battalion.

⁴⁹ Major Charles Evans, Fire Support Branch Chief, United States Army Infantry School. Based on the current program of instruction at the Infantry School, an infantry brigade commander's ADA education includes an hour class in IOBC, three hours of instruction in IOAC, and one thirty minute class in pre-command course, prior to both battalion and brigade command.

⁵⁰ Major Mike Hanchen, "JRTC Trends", ADA, January-February 1996, p. 14.

⁵¹ FM 44-3, p. 6-4.

⁵² FM 100-5, Operations, Headquarters, Department of the Army Washington D.C., 1993., p. 2-14.

⁵³ FM 44-64, p. 1-12. The ADADO section is usually comprised of only three to five personnel. FM 44-64 states that the ADADO "submits targets based on the ADA battalion S-2 analysis." This illustrates the fact that the 3-5 man ADADO section is truly only a liaison with the division. In this alternative, the ADCOORD does not have the manpower to perform air defense employment, intelligence, early warning, airspace management, targeting, and counter-air command functions. As a result, the ADCOORD is likely to be ineffective at synchronizing divisional air defense operations.

⁵⁴ FM 101-5, p. 4-22. Air Defense Coordinator (ADCOORD) responsibilities listed in this field manual are categorized into air defense command and control functions for this study.

BIBLIOGRAPHY

BOOKS

- Aker, Fred, October 1973- The Arab-Israeli War. Hamden, CT: Archon Books, 1985.
- Badri, El Hassan; Magdoub El Taha; Din Zohdy El Mohammed Dia, The Ramadan War. 1973. Dun Loring, VA: T.N. Dupuy Associates, Inc., 1979.
- Bjorklund, Raymond C., The Dollar and Sense of Command and Control. Washington D.C: National Defense University Press, 1995
- Caravella, Frank J., First To Fire. Fort Bliss, TX: OCADA, 1995.
- Carter, William Harding, Creation of the American General Staff. Washington D.C: Government Printing Office, 1924.
- Cesar, Edison M., "Strategies for Defining the Army's Objective Vision of Command and Control for the 21st Century." Santa Monica, CA: Arroyo Center, RAND, 1995.
- Coakley, Thomas P., Command and Control for War and Peace. Washington D.C.: National Defense University Press, 1992.
- Cordesman, Anthony H. and Wagner, Abraham R., Lessons of Modern War: Volume I. London: Mansell Publishing Limited, 1990.
- Cordesman, Anthony H. and Wagner, Abraham R., Lessons of Modern War: Volume II. London: Mansell Publishing Limited, 1990.
- Cordesman, Anthony H. and Wagner, Abraham R., Lessons of Modern War: Volume III. London: Mansell Publishing Limited, 1990.
- Doerner, Dietrich, The Logic of Failure. New York: Metropolitan Books, 1989.
- Fukuyama, Francis and Shulsky, Abhram, ' The "Virtual Corporation" and Army Organization.' Santa Monica, CA: Arroyo Center, RAND, 1997.
- Griffin, Gary B., The Directed Telescope. Fort Leavenworth, KS: United States Army Command and General Staff College, 1991.
- Herbst, Ph G., Alternatives to Hierarchies. OSLO: Work Research Institute, 1976.

- Herzog, Chaim, The Arab-Israeli Wars. New York: Vintage Books, 1984.
- Johnson, Stuart E. and Levis, Alexander, Science of Command and Control: Coping with Uncertainty. Washington D.C.: AFCEA International Press, 1988.
- Macgregor, Douglas A., Breaking the Phalanx. West Port CT: Preager Publishers, 1997.
- Marshall, S.L.A., Men Against Fire. Gloucester, MA: Peter Smith, 1978.
- Rockwell, James M., Tactical C3 for the Ground Forces. Washington D.C.: AFCEA International Press, 1986.
- Senge, Peter M., The Fifth Discipline. New York: Currency Doubleday, 1990.
- van Crevald, Martin, Command in War. Cambridge MA: Harvard University Press, 1985.

Periodicals

- Allard, Kenneth, "History, Technology, and the Structure of Command." Military Review, November 1981, pp.4-9.
- Bagnatti, Major Dave, "1-3 ADA Medals at the Olympics." ADA, April-May-June 1997, pp. 44-48.
- Braden, Lieutenant Colonel John W. Jr. and Major Baerman, John V., "The TOC: Backbone of Command and Control." Military Review, November 1981, pp.31-43.
- Collins, Captain James L. and Casmus, Captain David M., "Air Defense in Grenada." Air Defense Artillery, Spring 1984, pp. 13- 15.
- Franks, General Frederick M. Jr., "Battle Command: A Commander's Perspective.", Military Review, June 1996, pp. 4-25.
- Hahn, Daniel A., "Leadership: The Heart of C2." Military Review, November 1985, pp. 48-51.
- Hanchen, Major Mike, "JRTC Trends." ADA, January-February 1996, p.14.
- Leser, Lieutenant Colonel Jeffrey W.S., "Battle Command- Vision for Success." Military Review, April 1997, pp. 52-59.
- Long, Major Dennis, "Command and Control- Restoring the Force.", Military Review, November 1981, pp.44-47.

- Morrow, Captain Todd, "NTC Trends." ADA, September-October 1995, p. 14-15.
- McMahon, Major Timothy L., "The Key to Success: Developing a C2 Philosophy." Military Review, November 1985, pp. 42-44.
- Nifong, Lieutenant Colonel Michael R., "The Key to Information Dominance." Military Review, June 1996, pp. 62-67.
- Patrowitz, First Lieutenant William J. Jr., "The Aviation-Air Defense TOC in the 10TH Mountain Division." Army Aviation, December 1997, pp. 17-20.
- Schmidt, Lieutenant Colonel Robert L., "A Doctrine for Command." Military Review, November 1985, pp. 45-47.
- Tankley, Major David M., "C2: Finding the Middle Ground." Military Review, November 1985, pp. 52-55.

MONOGRAPHS

- Bielefeld, Major William C., Counterair Operations in the Light Infantry Division. Fort Leavenworth, KS: School of Advanced Military Studies, U.S. Army Command and General Staff College, December 1985.
- Braun, Major William G. III, Composite Warfare Commander (CWC): Implications for Force XXI Command and Control. Fort Leavenworth, KS: School of Advanced Military Studies, U.S. Army Command and General Staff College, December 1995.
- Hall, Russell, Battle Command: Tactical Decision-Making in the Information Age. Fort Leavenworth, KS: School of Advanced Military Studies, U.S. Army Command and General Staff College, December 1996.
- McGhee, Cornell T., Divisional Air Defense: The Shield of Blows. Fort Leavenworth, KS: School of Advanced Military Studies, U.S. Army Command and General Staff College, December 1992.

Government Documents and Military References

- A National Security Strategy for a New Century. Washington D.C.: The White House, October 1998.
- America's Army of the 21st Century Force XXI Meeting the 21st Century Challenge. Washington D.C.: Department of the Army, January 1995.

C4I for the Warrior Global Command and Control System- From Concept to Reality.
Washington D.C.: Department of Defense, 1994.

Evans, Charles, Fire Support Branch, Combined Arms and Leadership Directorate,
United States Army Infantry School, Fort Benning, GA, phone conversation on 4
December 1998.

FM 1-111, Aviation Brigades. Washington D.C: Headquarters, Department of the Army,
October 1997.

FM 22-100, Military Leadership, Headquarters, Department of the Army, Washington
D.C., June 1990.

FM 44-3, Air Defense Artillery Employment Chaparral/Vulcan/Stinger. Washington
D.C.: Headquarters, Department of the Army, June 1984.

FM 44-64, SHORAD Battery and Battalion Operations. Washington D.C.: Headquarters,
Department of the Army, June 1997.

FM 44-71, Air Defense Artillery Brigade Operations. Washington D.C.: Headquarters,
Department of the Army, 1994.

FM 44-100, US Army Air Defense Operations, Washington D.C.: Headquarters,
Department of the Army, June 1995.

FM44-100-2, Air Defense Artillery Reference Handbook. Washington D.C.:
Headquarters, Department of the Army 1992.

FM 71-10, Division Operations. Washington D.C: Headquarters, Department of the
Army, August 1996.

FM 100-5, Operations, Washington D.C.: Headquarters, Department of the Army, 1993.

FM 101-5, Staff Organization and Operations, Washington D.C.: Headquarters,
Department of the Army, June 1997.

FM 101-5-1, Operational Terms and Graphics, Washington D.C.: Headquarters,
Department of the Army, September 1997.

Hartzog, General William, "News Briefing on the Army's Redesign of Divisions." Fort
Monroe, VA: Headquarters, United States Army Training and Doctrine Command,
June 1998.

Johnsen, William T., "Force Planning for Army XXI." Carlisle PA: Strategic Studies Institute, US Army War College, 1998.

The Infantry Conference, Report of Committee "B" on Tactics and Techniques. Fort Benning, GA, June 1946.

TRADOC Phamplet 525-5, Force XXI Operations. Fort Monroe, VA, Headquarters, United States Army Training and Doctrine Command, August 1994.